# Providing a Framework of Effective Components in Iranian Championship Sports with a Data Mining Approach

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**A R T I C L E   I N F O**

**A B S T R A C T**

The main purpose of this study was to provide a framework of effective components in Iranian championship sports with a data mining approach. The research method was qualitative. The advanced search was performed in the general framework of factors affecting the sports industry and development and integration with data-driven technologies. Based on the literature review, 15 frameworks in the field of sports and 13 frameworks for the development and integration of the sports industry with technology were identified. After the data analysis, a researcher-developed framework for the championship sports industry for the use of data-driven technologies and data mining was presented in three parts. In the first part, nine influential factors including athletes/champion teams, leagues/clubs, stadiums/sports venues, fans/spectators, brands, media, government, academic/research institutions, and technology companies, were identified. In the second part, a strategic plan based on the development and integration of sports industry with data-driven technologies and data mining was presented, which includes four stages: Identifying and selecting talents, pre-game and match preparation, in-game and match activities, and post-match and match analysis. All data-driven activities and data mining in the first and second sections were performed by the IBM data science analysis methodology presented in the third section. Then, a conceptual framework was provided to 7 experts and their opinions were collected through semi-structured interviews and focus group methods. This conceptual framework enables sports managers to plan for their organization and adopt appropriate strategies using data-driven technologies and data mining.

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## Introduction

In the last three decades, computer devices have expanded and developed effectively in all aspects of individual and social life. These devices are becoming more versatile and intelligent, with each person carrying at least one smart computer device over the past decade. The availability and ubiquity of these devices has brought about many changes. One of the most important of these developments is the mass production of data and information. This information is different, from personal information to city and country. Some of this information is only available to the individual and some of it is shared with different individuals and groups although the type and characteristics of this information are different, the point is clear and unquestionable that large volumes of data and information are being produced. This information is usually stored raw and with a complex structure. However, if this information is systematically and regularly evaluated and analyzed, it can produce great value for individuals, society and industry owners (Curry, 2016).

In addition to the technologies that have revolutionized the electronic engineering and hardware of computers, there are also technologies for making computers smarter and analyzing the data generated and stored on them. In general, a set of technologies focused on analyzing and utilizing the information produced is called "data science" and "data-driven" technologies. "Artificial intelligence", "machine learning" and "data mining" can be considered as subsets of "data science". Each of these technologies has a different purpose, but "data mining" can be used as the beginning of information retrieval in different fields and industries (Provost & Fawcett, 2013).

The sports industry, like other industries, is evolving every day with new technologies. In the last decade, with the introduction of computer technologies and the comprehensive change and development of the sports industry, especially in the field of championship sports, a huge amount of raw data has been produced. This "big data" is produced at any time and in different dimensions of time, place, individual and cultural conditions in the field of sports. This information is very valuable and practical and has created a unique opportunity for intelligent sports managers to optimize and exploit it in order to optimize and develop sports, especially championship sports (Schumaker, Solieman, & Chen, 2010). With the dramatic developments of science and technology, as well as the "development and integration" between them and sports, the presence and creation of honor in sports fields, especially in the international arena, is no longer easily possible and achievable. Rivals no longer think of winning hand-to-hand combat, and the successes and failures of heroes are no longer just the result of physical activity and strenuous physical training, but have been altered by advanced technology and equipment and broken down by technology and computer programs. And are analyzed, designed, built and processed. Industrial, electrical and electronic revolutions, information technology and the Internet have brought about great changes. These developments have directly affected the way people and organizations compete, so that the survival and success of athletes and sports clubs depends on the availability and use of modern technologies. Optimizing, lowering costs and increasing productivity is the key to success in sports competitions and tournaments. Every day, a large amount of information is created by athletes, champions, teams, leagues, clubs, sponsors, winners, spectators, media and other related and sports and championship sports professionals in our country. But in fact the product of all this is a vast amount of raw but valuable information and data, which is usually either not identified and ignored or ignored; In both cases they are not used. What is certain is that all of this raw data has no competitive value without being identified, collected, organized, analyzed, and concluded. Today, advanced technologies such as "data mining" have received much attention and exploitation in global industries, especially in the world sports industry (Ofoghi, Zeleznikow, MacMahon, & Raab, 2013).

To achieve sustainable success in sports, "the first fundamental step in designing the sports policy of any country is to define and interpret the concept of sports development. This concept is defined by the same sports policies " (Bramham, 2001) And "part of the development of sports is tied to the concept of the development of championship sports and the training of champion athletes" (Houlihan & Green, 2007). Also, "the success of countries in international sports arenas, in addition to social and economic effects, is a symbol of stability and comprehensive capabilities of those countries and one of the reasons for the high investment of countries in sports." Heroism and professionalism stem

from this"(Hosseini, Hamidi, Rajabi, & Sajjadi, 2013). On the other hand, due to the vastness of the field of sports and the fact that many factors interact with it and are not limited to athletes and other sports executives, therefore, sport is also introduced as an industry and a group of sports professionals. And all the relevant factors, stakeholders and influences on it constitute the "sports industry". "The sports industry is defined as a market in which products are offered to its buyers, including physical fitness and health, sports, recreation and entertainment. These products include tools, services, people, places and ideas. The products of the sports industry can also be mentioned as follows: health activities and services and goods related to physical fitness, sports activities and services related to them, entertainment and recreational activities and all services related to them. As well as all goods and services related to management, finance, marketing, executive and commercial" (Pitts, Fielding, & Miller, 1994). In addition, because in the sports industry, influential factors do not only include human factors, therefore, the issue of ecosystem and industrial ecosystem is also raised. An ecosystem refers to "a community of living things in relation to the non-living components of their environment that interacts as a system" (Smith, Anderson, & Smith, 2015) And industrial ecosystem, or industrial ecology, is defined as a systems-based, multidisciplinary discourse that seeks to understand the emerging behaviors of complex integrated human / natural systems (Allenby, 2006).

Numerous influential factors in the championship sports industry have been presented and expressed by researchers, including the role of government officials, fans, sponsors, brands, media and other components of the championship sports ecosystem. Some of these factors are listed in Table 1.

**Table 1.** Components affecting the championship sports industry

| Effective components | Reference |
|---|---|
| Government policies, laws and regulations | (Kashef, Syed Ameri, ahmadi, & marefat, 2018), (Gilson et al., 2019) |
| Spectators, fans and sponsors | (Asselstine & Edwards, 2019) |
| Brand, club, team, being famous, being popular | (Pelechrinis, Winston, Sagarin, & Cabot, 2018) |
| Facilities, equipment, tools and hardware | (Yurko et al., 2020) |
| Private, state and local media | (Mollaei & Nejad, 2013) |
| Athletes of different age groups | (Mollaei & Nejad, 2013) |
| Environmental and climatic factors | (De Leeuw, Meerhoff, & Knobbe, 2018) |
| Cultural factors and institutions of science production | (Kashef et al., 2018) |
| Companies manufacturing sports equipment and related to sports | (Khosromanesh, Khabiri, Khanifar, Alidoust Ghahfarokhi, & Zarei Matin, 2019), (Pourkiani, Hamidi, Goodarzi, & Khabiri, 2017), (Wanless & Naraine, 2021) |

In addition to academic research in the practical and non-academic sector, studies and studies have been conducted by researchers and consulting companies in the world and the results of the studies are reported to the sports industry community and investors and sponsors. Such as study reviews and reports of consulting companies PWC (PricewaterhouseCoopers, 2019), Launchvic and KPMG (KPMG, 2019), ABEAM (ABeam, 2018), Deloitte (Deloitte, 2017), NEWZOO (Newzoo, 2017), KPMG (KPMG, 2016), Kearney (Kearney, 2014), Researchers have pointed to the role of organizations and governments, the media, brands and fans, and sponsors and other components of the sports industry ecosystem as factors influencing the championship industry and sports.

In line with the purpose of this research and exploiting the benefits of "data mining" science and the need to use it in Iranian championship sports, it was necessary to carry out "data-driven" and "data mining" projects, initially by exploratory method. - Analytically, to identify and introduce the influential factors in the Iranian championship sports industry and the relationship of these components with the champion teams and players, so that a framework can be used by all users to apply and benefit from technology and "data science". "Artificial intelligence and data mining." The actual data mining task is the semi-automatic or automatic analysis of large quantities of data to extract previously unknown, interesting patterns such as groups of data records (cluster analysis), unusual records (anomaly detection), and dependencies (association rule mining, sequential pattern mining).

## Methodology

This research was a qualitative study. To fulfill the research objectives, literature review and systematic analysis of prior work were conducted  We have searched for the "frameworks", "technology", "data mining" in the sport industry and related industriesm  e performed comparative analysis, as well as "Meta-analysis" to identify unique stakeholders, their properties and relationships. We designed a conceptual framework based on the sport industry demands as well as social and technological requirements. To better evaluate and verify the conceptual framework, we surveyed expert in the areas of "data mining", "sport", and in particular "professional sport"  Experts were selected based on their background and reluctance to the project. In total, 30 experts responded to the survey. The survey was designed with "Likert scale" of five points. Experts have been purposefully selected based on their educational, research, professional and professional backgrounds.

## Qualitative research methods

This research is done using the method of "meta-synthesis research". It should be noted that several methods have been proposed to perform "meta--synthesis" that the researcher uses the seven-step method (Sandelowski & Barroso, 2006). The steps of this methodology are as follows:

• Set up a research question

• Systematic review of literature

• Search and select texts

x Extract textual information

• Analyze and combine analysis findings

Q Quality Control

P Presentation of findings

Accordingly, after designing the question and the subject of the research, review and systematic studies are conducted to identify and collect information related to the subject of the research with the aim of combining, interpreting and analyzing the findings of related and similar topics. After identifying and categorizing useful and relevant sources, finally, by studying, comparing and in-depth and meta-analytical study, the desired information is extracted. Then, by establishing a connection between all the data and paying attention to the first important point, namely the unique conditions of each society, a framework has been designed and adjusted.

At the beginning and beginning of the research, using the "Saunders research method", the layers of this research have been separated: According to this model, a research consists of different layers, each of which is affected by a higher layer. These layers are:

1) Research philosophies layer

2) Layer of research approaches

3) Research strategies layer

4) Selection layer of research methods

5) Research time horizon layer

6) Layer data collection methods

According to this methodology in the first layer, the present study is known as "realistic" in terms of research philosophy, because it identifies the realities of Iranian championship sports to implement "data mining" projects in them.

In the second layer, the approach of this research is "deductive". In other words, in order to plan and implement "data mining", in the first stage, the researcher has determined the generalities and effective factors from the whole to the part, and in the next stage, for each component, a separate and specific data mining project. Be defined.

The research strategy in the third layer is "review" in terms of the type of research and "applied" in terms of purpose, because the researcher uses the review of other researchers' research studies to promote the progress of championship sports and heroes and collect medals and eliminate Explains and presents problems using and using big data, a conceptual framework.

Regarding the fourth layer, the research method is qualitative.

In the explanation of the fifth layer, it is stated that the studies are of exploratory, descriptive-analytical and explanatory type and in a specific and "cross-sectional" period of time.

Finally, in the sixth layer, the "analysis" of research data obtained through studies, surveys and interviews is discussed.

## Results

According to the theoretical foundations and frameworks, models, structures and ecosystems of "sports industry", and frameworks for development and integration of sports industry with "data-driven" and "technologies", the results of domestic and foreign research related to the subject of the research, and taking into account the specific conditions of society, culture and championship sports of Iran, the authors provides a three-part conceptual framework as follows:

Part 1) Iranian championship sports industry ecosystem in order to use "data-driven" and "data mining" technologies with a focus on the champion team / player

Part 2) Introducing the sports organization management strategy framework using "data-driven" and "data mining" technologies

Part 3) IBM Data Science Methodology (IBM, 2015)

## Explanation of the conceptual framework

Part 1: In this section, 9 components, beneficiaries, related and effective components of the Iranian championship sports industry ecosystem and the relationships between them are presented, including: a) three decision-making organizations, content production and assistants b) 6 beneficiaries

A) The three main organizations of decision making, content production and assistance in scientific and research fields, including:

Ministry of Sports and Youth, sports federations and the National Olympic Committee of Iran 2) technology companies 3) universities, consulting companies and laboratories, etc.

B) 6 other related stakeholders including: leagues (clubs), stadiums and sports venues and spaces, media, brands, spectators and fans and finally the main stakeholder in this research is the team / The player is identified, introduced, and the relationships and key point of communication between them, the "financial flows," are presented (Figure 1). As can be seen in the picture, the relationship of the

three decision-making organizations, content production and support by the red square box and the flash lines, with all the components as well as the relationships between the components by the streams. Financial, determined and specified.
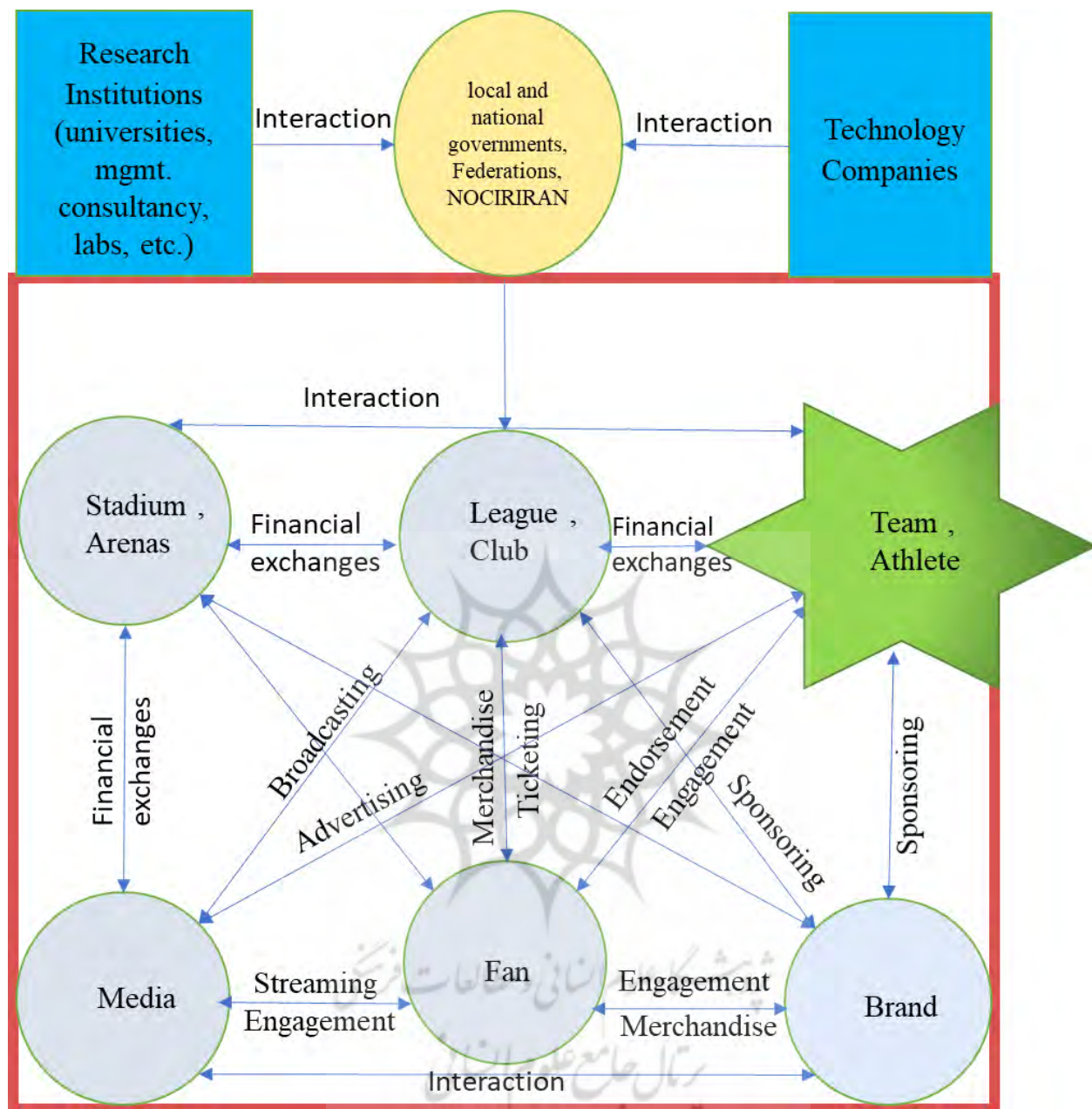


**Figure 1.** The first part of the conceptual framework of the Iranian championship sports industry ecosystem in order to use data mining technology with a focus on the champion team / player

**Part 2:** This section refers to the stages of management and adoption of appropriate strategies in 4 timing stages based on the application, development and integration of "championship sports industry" with "data-driven technologies" and "data mining":

Identification, talent search and selection stage

Pre-match and game stage, preparation

Stage during the match and game, action and activity

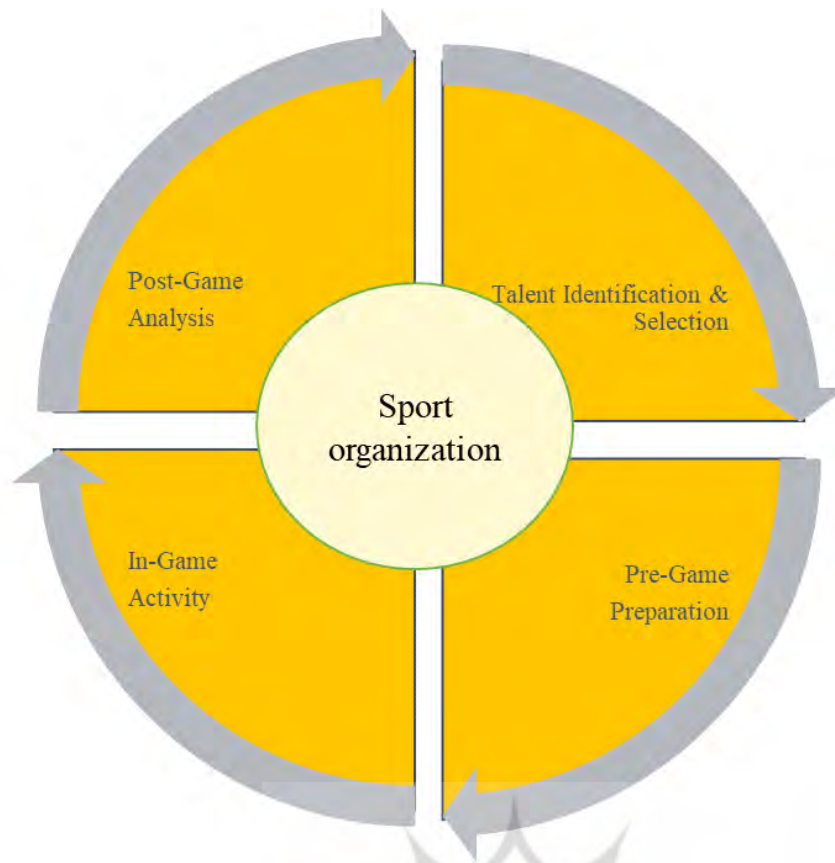The next stage after the match and the game, analysis (Figure 2).

**Figure 2.** The second part of the sports organization management strategy framework for the use of technology

**Part 3:** In the last stage and after performing all activities, data collected from all components and factors affecting the first part, as well as data from the four stages of implementation and strategies The operations of the second part must be analyzed by "artificial intelligence" and "data science", "data mining" and experts to obtain the final results and information for use and exploitation.

In this project, the "data science methodology" provided by IBM (IBM, 2015) is introduced to give an overview of the operational stages of data mining. (Figure 3) shows the ten repetitive cyclic steps for dealing with the problem with the ultimate goal of exploring data and gaining new knowledge.
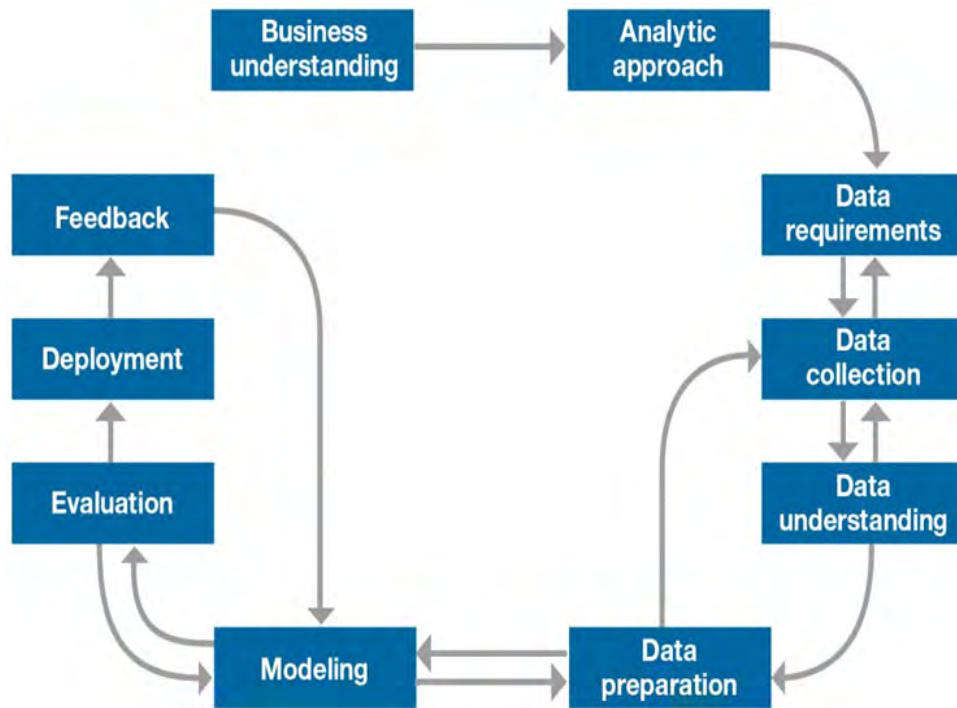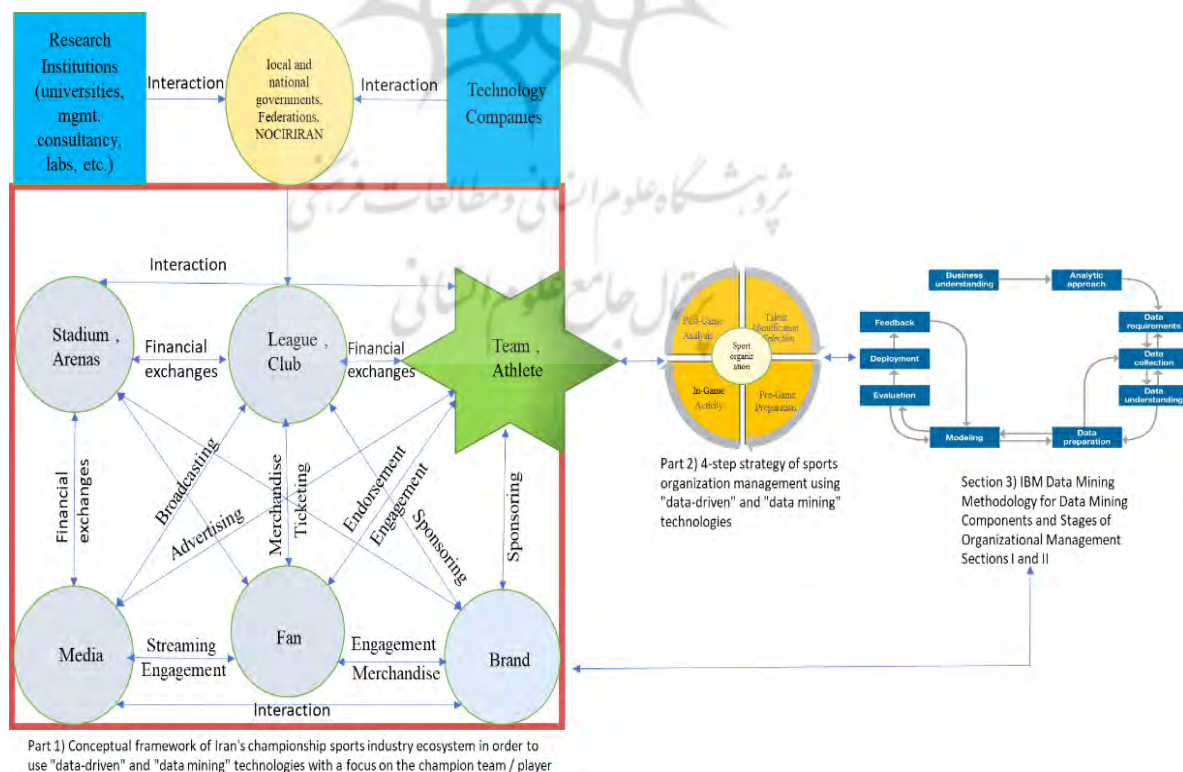
**Figure 3.** The third part of the conceptual framework of the Iranian championship sports industry ecosystem developed by IBM "Data Science Methodology"

## Summarize the conceptual framework

The three-part conceptual framework of the Iranian championship sports industry ecosystem in order to use "data-driven" and "data mining" technologies with a focus on the champion team / player, the framework of the sports organization management strategy using "data-driven" technologies and "data mining", provided by IBM's "Data Science Methodology" (Figure 4).



**Figure 4.** Three-part conceptual framework of the Iranian championship sports industry ecosystem

Figure 4 includes the three-part conceptual framework of the Iranian championship sports industry ecosystem in order to use "data-driven" and "data mining" technologies with a focus on the champion team/player, the framework of the sports organization management strategy using "data-driven" technologies and "data mining", provided by IBM's "Data Science Methodology"

## Discussion and Conclusion

The purpose of this study is to present and explain the framework of "data mining" in order to promote championship sports, participation in international competitions and arenas, winning medals and creating pride, taking into account financial flows and revenue generation. Accordingly, the researcher has designed and presented a conceptual framework for the development and integration of all stakeholders and factors affecting the "championship sports industry" and "data-driven" and "data mining" technologies.

"Data-driven" technologies are expected to revolutionize the "sports industry" by increasing "value creation" and profitability, however, the full "development and integration" of technologies "Data-driven" in the "sports industry", especially the "championship sports industry" in the world and Iran, remains a challenge. The proposed framework enables the managers of the "championship sports industry" to plan for their organization and adopt appropriate strategies using "data-driven" and "data mining" technologies. Using this conceptual framework, the managers of the "championship sports industry" of the country can make the best use of the technological benefits for the benefit of their organization.

Because the collection and exploitation of data from all components of the Iranian championship sports industry is the basis of "data mining", valuable data and information that is sometimes hidden and Or complexity, not seen and not identified, and often due to negligence, anonymity or concealment of the location, centers or their type, so it was first necessary to identify, determine and specify the locations and Sources of data collection and information, which are the same stakeholders and influencing factors, should be acted upon (Part 1 of the Conceptual Framework). 9 factors identified in the first part include: The Ministry of Sports and Youth, sports federations and the National Olympic Committee of Iran, technology companies, universities, consulting companies and laboratories, etc., and six stakeholders Other related: leagues (clubs), stadiums and sports venues, media, brands, spectators and fans and finally the main stakeholder is the team / player. After identifying and determining the influencing factors, in the next stage, by adopting appropriate organizational and managerial strategies (Part II of the conceptual framework) and by the operational stages of "Data Science" and "Data Mining Methodology" (Part III of the framework) Conceptual), analyzes and analyzes this data and obtains useful practical information. As mentioned in the description of the conceptual framework, this framework consists of three parts and the main focus is on the focus of the champion team / player. Components and influencing factors are operating and independent organizations that have their own internal, subsidiary and operational departments, these sub-categories are not included in this framework. Sectors such as cultural affairs, international affairs, competition tourism and sports, etc. For example, in sending teams or players to overseas competitions, the international relations section is also discussed, but this section does not have an independent organizational nature, and as a sub-section and in the Ministry of Sports and Youth, federations Or the National Olympic Committee is active. Or to hold sports events such as competitions and conferences, the executive staff of the organizer, public relations and other related departments. The same is true of tourism and sports competitions and championships and championships. On the other hand, each of these components has different divisions and functional activities, such as the media, which deals with different types of news by different sections, including television, Internet and publications, and of course other topics. The same goes for broadcasting and advertising. From another point of view, sponsors and sponsors have a special place in the field of championship sports, but they are not considered as an independent organization because brands generally play this role, and for this reason. Are introduced by the manner and methods of communication in the framework. On the other hand, due to the similar operational nature of

"spectators and fans" as well as "league and club" in terms of identifying, selecting and focusing on the champion team / player, these components are mentioned in one category, although certainly in addition to similarity There are many differences with each other.

It is important to note that: The purpose of communication is to identify the financial flows between the components. Information sources and other previous research such as Deloitte, PWC, Kearny have also dealt with communication based on this. Of course, each of them has a focus on a component, for example, Deloitte has focused on the fans and Kearny has focused on the league. In response to the fact that "the goal is not to study the financial flow and the promotion and winning of medals is the goal of championship sports, the researcher states that: In the championship sports industry, only the champion team or player focuses on performance and performance and other components such as Brands, media and sponsors aim to make money and profitability alongside the team and the champion player.

On the other hand, the scope and scope of activity of each of these nine factors requires specific and separate research for each of the stakeholders in this framework, which does not fit in one study. Accordingly, in this research, in general and outside of dealing with internal divisions and components, each of the independent organizational factors related to championship sports are presented. And of course, the relationships between the components and the complexity of these relationships are much more than mentioned.

## Statistical Society

Research and studies and related research results found on reputable sites such as Google Scholar, Science Net, Irandoc, as well as reports from consulting companies such as PWC, Deloitte, Kearney, KPMG, ABEAM, Launchvic, NEWZOO and other scientific research institutes as well as other researchers, for 30 years, from 1990 to 2020.

Experts and specialists in the field of "data mining" and "sports", especially "championship sports" in order to approve and modify the conceptual framework, purposefully selected according to academic and research background, job and professional.

## Recommendations

From a practical point of view, considering all the benefits of "data science" and "data mining" and also based on the results of this research, there is a need for champion teams and players or on the track and in the dream of championship and for all Define and design team and individual sports disciplines, dedicated "data mining" projects. Accordingly, there is a wide and untouched platform for "data mining" in various fields of sports and "championship sports industry", teams, players and clubs of the country and other related and stakeholders. Which should be exploited more and better.

On the other hand, despite the limited studies and research in the field of "data science" and "data mining" in Iran, the examples show the potential for success. Accordingly, and considering the numerous advantages and benefits of "data-driven" technologies on the one hand and the lack of internal studies and research and the application of "data mining" in Iranian sports, and on the other hand, the tangible needs of the sports industry and especially The field of "championship sports" using "data mining", the need for theoretical and practical studies in this field seems very necessary. And as mentioned, the scope and scope of activities of each of these nine factors requires specific research for each of the stakeholders in this framework, which does not fit in one study. Accordingly, it is suggested that other researchers and studies also study "data mining" for each of these factors separately and also in relation to the national champion teams and players, as well as other Fields like public sports.

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